CLAIMS

1. A membrane electrode assembly for use in a direct oxidation fuel cell comprising:

a layer of material which is substantially impermeable to water and carbonaceous fuel;

first and second protonically conductive membranes disposed, respectively, on opposite surfaces of said layer;

selected sites in said layer enabling protonically conductive contact between said first and second membranes;

first and second catalysts disposed, respectively, on the surfaces of said membranes which are not in contact with said layer; and

first and second diffusion material layers disposed, respectively, on the surfaces of said catalysts which are not in contact with said membranes.

2. The assembly as in claim 1 wherein said layer comprises a microporous material.

3. The assembly as in claim 1 wherein said layer comprises a polyester microfilm with microperforations.

4. The assembly as in claim 1 wherein said layer comprises a polyimide film with microperforations.

5. The assembly as in claim 1 wherein said assembly is used in a direct methanol fuel cell.

6. A layered membrane for use in a direct oxidation fuel cell comprising:

a layer of material which is substantially impermeable to water and carbonaceous fuel; and

first and second protonically conductive membranes disposed, respectively, on opposite surfaces of said layer; and

selected sites in said layer enabling protonically conductive contact between said first and second membranes.

7. The membrane as in claim 6 wherein said layer comprises a microporous material.

8. The membrane as in claim 6 wherein said layer comprises a polyester microfilm with microperforations.

9. The membrane as in claim 6 wherein said layer comprises a polyimide film with microperforations.

10. The membrane as in claim 6 wherein said membrane is used in a direct methanol fuel cell.

11. A method of constructing a layered membrane for use in a direct oxidation fuel cell comprising the steps of:

providing a layer of material which is substantially impermeable to water and carbonaceous fuel; and

providing, on opposite sides of said layer, protonically conductive membranes;

and providing sites in said layer which allow protonically conductive contact between said protonically conductive membrane.

12. The method as in claim 11 wherein said layer comprises a microporous material.

13. The method as in claim 11 wherein said layer comprises a polyester microfilm with microperforations.

14. The method as in claim 11 wherein said layer comprises a polyimide film with microperforations.

15. A method of constructing a membrane electrode assembly for use in a direct oxidation fuel cell comprising the steps of:

providing a layer of material which is substantially impermeable to water and carbonaceous fuel and which permeable to protons;

providing, on opposite sides of said layer, first and second protonically conductive membranes;

providing sites in said layer which allow protonically conductive contact between said protonically conductive membrane; and

providing, on the surfaces of said membranes which are not in contact with said layer, first and second catalyst layers; and

providing, on the surfaces of said first and second catalyst layers which are not in contact with said membranes, first and second distribution layers.

16. The method as in claim 15 wherein said layer comprises a microporous material.

17. The method as in claim 15 wherein said layer comprises a polyester microfilm with microperforations.

18. The method as in claim 15 wherein said layer comprises a polyimide film with microperforations.

19. A direction oxidation fuel cell comprising:

an anode;

a cathode;

a membrane electrode assembly, said assembly including a layer of material which is substantially impermeable to water and fuel, first and second protonically conductive membranes disposed, respectively, on opposite surfaces of said layer, sites in said layer that allow protonically conductive contact between said membranes, first and second catalysts disposed, respectively, on the surfaces of said membranes which are not in contact with said layer, and first and second diffusion material layers disposed, respectively, on the surfaces of said catalysts which are not in contact with said membranes; and

a housing in which said anode, cathode and assembly are disposed.

20. The fuel cell as in claim 19 wherein said layer comprises a microporous material.

21. The fuel cell as in claim 19 wherein said layer comprises a polyester microfilm with microperforations.

22. The fuel cell as in claim 19 wherein said layer comprises a polyimide film with microperforations.

23. The fuel cell as in claim 19 wherein said fuel cell is a direct methanol fuel cell.